

WALNUT HUSK FLY: VARIETAL SUSCEPTIBILITY AND ITS IMPACT ON NUT QUALITY

W. W. Coates

ABSTRACT

This survey confirmed that walnut varieties vary in walnut husk fly (WHF) susceptibility when grown in a mixed variety orchard. Serr (74% damaged) was more susceptible than Howard (31%) in location one. Vina (26.3%) and Tulare (16.3%) were more susceptible than Chandler (0.3%) in location two. Chandler was also damaged later in the season than other varieties. Many quality parameters including % insect, % mold, % shrivel, color, relative light index (RLI), % large sound, % adhering hull, and % edible yield were adversely affected by WHF damage. Losses in relative value due to WHF damage were 38% for 'Serr', 36 % for 'Vina' and 30% for 'Tulare' when compared to undamaged nuts from the same orchard.

OBJECTIVES

1. The first objective of this project was to compare the walnut husk fly (WHF) susceptibility of several varieties in mixed variety orchards. Previous research in 2004¹ showed that there was considerable variation in WHF susceptibility among varieties and when grown in mixed variety orchards. In 2005, the opportunity to test multiple varieties again arose due to severe WHF infestations in some mixed variety orchards near Hollister, CA.
2. The second objective was to compare a sample of walnuts that was completely free of WHF damage versus a similar sample from the same location and variety that had 100 percent WHF infestation in order to directly compare WHF impacts on quality and value.

PROCEDURES

1. One hundred (100) nut samples were collected at random from two walnut varieties ('Serr' and 'Howard') in a mixed variety orchard (location 1) on September 28 on the date of commercial harvest. Samples of varying sample size (190 to 300) were also collected from a second orchard (location 2) on October 4 just before commercial harvest consisting of mixed 'Vina', 'Tulare' and Chandler' varieties. These were rated for WHF damage. Damage was assessed by visual inspection. These samples were taken from different orchards than those sampled in 2004¹ and both were organically farmed. These locations received either no WHF sprays or an inadequate number of GF-120 sprays.
2. Two 100 nut samples of 'Serr' (location 1) as well as 'Vina' and 'Tulare' (location 2) walnuts were collected at harvest. One sample had no damaged nuts and one sample had all damaged nuts. These samples were dried in mesh bags in a drying oven with a maximum temperature of 110 deg F. After drying, nuts were brushed with a wire brush to remove excess adhering hull. Dried samples of the damaged and undamaged 'Serr', 'Vina' and 'Tulare' nuts were submitted to Diamond Foods, Inc. for crackout analysis.

RESULTS

The results for the first objective are shown in Table 1. At location 1, ‘Serr’ had 74% and ‘Howard’ had 31% WHF damage. At location 2, ‘Vina’ had 26.3%, ‘Tulare’ 16.3% and ‘Chandler’ 0.3% WHF damage. At harvest, WHF trap catches were dropping rapidly and new damage was rare. In location 2, WHF infestation appeared to begin later in the season for ‘Chandler’ than for other varieties.

The results for objective 2 are shown in Table 2 (kernel characteristics) and Table 3 (external and whole nut characteristics). Percent insect damage was higher in all WHF damaged samples versus the undamaged – the insect was not identified as to codling moth or navel orangeworm. Percent mold was higher in all WHF damaged samples – especially for ‘Vina’ which was 12.4% compared to 0.0% in the undamaged sample. Percent shrivel was higher for all WHF damaged samples especially ‘Vina’ which was 21.9% versus 1.1% in the undamaged sample. There were no extra light color kernels in any WHF damaged samples. Amber color was substantially higher in the WHF damaged ‘Tulare’ sample with 32% amber versus 0% in the undamaged sample. The RLI was lower for all WHF damaged samples. RLI is the light reflected off of nut samples – higher (lighter) is better. The average nut weight was slightly lower for all WHF damaged samples. The percent of large nuts was similar for all samples but substantially different for percent large sound nuts with WHF damaged samples for each variety lower. The percent adhering hull, as expected, was higher for all WHF damaged samples. The percent edible yield was lower for all WHF damaged samples.

For ‘Serr’, the relative value was .9635 for undamaged nuts and .5981 for damaged. This amounted to a 36.5 cent loss (38 percent) in relative value due to WHF damage. ‘Vina’ had a relative value of 80.01 for undamaged nuts versus 51.28 for damaged. This amounted to a 28.8 cent loss (36 percent) in relative value for ‘Vina’. ‘Tulare’ had a relative value of 1.0309 for undamaged and .7176 for damaged. This amounted to 31.3 cent loss (30 percent) in relative value for ‘Tulare’. Relative value is a composite figure taking into account a number of crackout variables.

DISCUSSION

The University of California publication (publication #3270) “Integrated Pest Management for Walnuts, 3rd edition” (IPMW)² states that ‘Tulare’ is very susceptible to WHF. This project confirms that documented susceptibility. However, IPMW also states that ‘Serr’ and ‘Vina’ are fairly tolerant. This does not agree with past field observations in San Benito County where ‘Vina’ and ‘Serr’ are considered very susceptible when a high WHF population is present. This year’s results agree with these past local observations – ‘Vina’ and ‘Serr’ were both very susceptible. ‘Howard’ seems to be intermediate in tolerance. In agreement with IPMW, ‘Chandler’ appears to be tolerant. Past observations of ‘Chandler’ also are in agreement with findings this year that this variety is infested later in the season than other varieties.

The results of the direct comparison of infested and uninfested ‘Serr’, ‘Vina’ and ‘Tulare’ walnuts confirm that there were substantial WHF impacts on many quality parameters and on relative value. Among these were adhering hull, % insect, % mold, % shrivel, % edible yield, color, % large sound, external damage, offgrade kernel, and RLI. The results are similar to 2004 tests¹ except for increased mold this year.

Walnut husk fly susceptibility has been a very important factor for organic walnut production in the Central Coast. ‘Chandler’ has been recommended as the variety of choice because of reduced incidence of walnut blight, codling moth and WHF. With the introduction of organically acceptable insecticides for WHF management (GF-120, Entrust + NuLure bait and Surround), the importance of this factor has been reduced but a reduction in the number and total cost of sprays is still a factor in favor of ‘Chandler’.

ACKNOWLEDGEMENT

The assistance of Diamond Foods, Inc. in performing crackout analyses on all samples is gratefully acknowledged.

REFERENCES

1. Coates, William W. 2005. Walnut Husk Fly: Varietal Susceptibility and Quality Observations. Walnut Research Reports – 2004, pp 179-181. Walnut Marketing Board, Sacramento, CA.
2. Strand, Larry L. (editor). 2003. Integrated Pest Management for Walnuts, 3rd Edition. University of California Agricultural and Natural Resources Publication 3270, p 52.

Table 1: Walnut Husk Fly – Varietal Susceptibility 2005.

Location	Variety	% WHF	Sample Size
1	Serr	74.0	100
1	Howard	31.0	100
2	Vina	26.3	190
2	Tulare	16.3	200
2	Chandler	0.3	300

Table 2: Comparison of Kernel Characteristics of ‘Serr’, ‘Tulare’ and ‘Vina’ English Walnut Varieties with (+WHF) and without (-WHF) Walnut Husk Fly Damage – 2005.

	%Insect	%Mold	%Shrivel	%EL	%L	%LA	%AMB	RLI
Serr-WHF	2.4	0.0	0.0	22	69	8	1	51.3
Serr+WHF	14.6	3.4	6.7	0	22	77	1	45.9
Tulare-WHF	1.3	0.0	0.0	35	59	6	0	53.9
Tulare+WHF	3.7	2.5	1.2	0	12	56	32	44.4
Vina-WHF	3.3	0.0	1.1	21	73	6	0	50.4
Vina+WHF	3.8	12.4	21.9	0	43	47	9	47.9

Kernel Color: EL=extra light, L=light, LA=light amber, AMB=amber
 RLI= Relative light index

Table 3: Comparison of External and Whole Nut Characteristics of ‘Serr’, ‘Tulare’ and ‘Vina’ English Walnut Varieties with (+WHF) and without (WHF-) Walnut Husk Fly Damage –2005.

	Ave. Nut Weight (g)	% LG	% LG Sound	% Adh Hull	% Edible Yield	Relative Value
Serr-WHF	12.05	95	87.2	0.0	51.60	0.9635
Serr+WHF	11.24	94	2.4	91.0	35.80	0.5981
Tulare-WHF	13.03	100	98.7	0.0	52.54	1.0309
Tulare+WHF	12.35	100	4.8	93.8	44.40	0.7176
Vina-WHF	11.01	85	84.2	0.0	43.61	0.8001
Vina+WHF	9.55	78	0.0	68.6	29.41	0.5128